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ABSTRACT

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A SUMMARY OF THE INSTRUCTIONAL SYSTEM USED BY THE OPEN UNIVERSITY IN GREAT BRITAIN IN 1971

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The Open University

The instructional system being used by the Open University in Great Britain this year is unique: no other institution of higher education in the world has such a system. It is also the most advanced and sophisticated multi-media instructional system being used to teach large numbers of students at a distance.

This paper describes the system's characteristics and the major learning resources available to Open University students, and indicates how the course units in particular have been developed. The integration of these resources into an instructional system providing university education throughout the British Isles is outlined. Some details are provided of the steps being taken or being planned to evaluate the effectiveness of the system.

September 1971

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USED BY THE OPEN UNIVERSITY IN GREAT BRITAIN IN 1971

The instructional system being used by the Open University in Great Britain this year is unique: no other institution of higher education in the world has such a system. It is also the most advanced and sophisticated multi-media instructional system being used to teach large numbers of students at a distance. This paper summarises the system's characteristics.

The combination of learning resources in use

In considering the combination of learning resources in the system, we should state first who our students are, since the resources have been chosen to match the learners. We are enrolling for the Open University people who are generally over 21 and working full-time. They do not necessarily have good secondary school qualifications. All of them wish to take a university degree because they did not have the opportunities before or could not take full advantage of them. For 1971 we had some 40,000 applications and admitted over 24,000 to the first year of study. Ideally, we should know far more about our learners, but we shall have to collect data first, since they are a heterogeneous group.

The learning resources themselves should now be described. First, and most important, the Open University student receives regularly through the mails correspondence packages containing basic course materials. Each package probably contains roughly four weeks' work, separated into four units. In 1971, there have been 36 units of study in the year for each course. A student may take one or two courses a year.

A typical unit contains a considerable amount of exposition, illustrated by diagrams or pictures where necessary. To assist the student in assimilating the content, there are self-assessment exercises in which the student works out the answers to questions and then checks whether he is right by turning to a page on which the answers are shown. There are also unit tests or assignments, which are completed by the students and then sent to the Open University. Some of the assignments go to be machine-marked by a document reader linked to a computer. Others go to correspondence tutors to be marked and commented upon before they are returned to the students. Some units include special materials such as

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glossaries. Others direct students to special supplementary pages containing remedial or enrichment material. Also contained in the packages may be notes about the television and radio programmes.

The second learning resource available to the student in 1971 has been a part-time class tutor. The correspondence tutor not only scores the tests or assignments; he also advises the student on further learning required. But if the student wishes to receive face-to-face assistance he goes to a study centre where he is to meet the class tutor. The work of both the class tutors and the correspondence tutors is co-ordinated by staff tutors, who are full-time members of the Open University staff.

The study centres represent the third learning resource and are located in over 250 communities. Besides being staffed by the class tutors they are also places where students may meet counsellors, whose task it has been to deal with any general problems students have in learning from the Open University's instructional system. For instance, if a student falls far behind, the counsellor is there to advise him on whether to omit work in order to catch up. In the study centres there are also television and VHF radio sets. In many study centres there are additional facilities, such as audio and video playback machines, and computer terminals for mathematics students.

The fourth learning resource available to students has been the summer school. Each student is expected to attend summer schools for up to two weeks in his first year. In these schools he not only receives additional face-to-face assistance but also engages in activities important for university level courses and impossible to arrange in the study centres. Laboratory work features prominently in the science summer schools, for example. The summer schools have been held in conventional universities and came in the middle of the Open University academic year, which lasts ten months, beginning in January.

As many people know, broadcasts have important qualitative roles in the Open University instructional system. Each unit of each course this year has been accompanied by a 25 minute telecast (uninterrupted by advertisements). The question of how the television broadcasts are integrated with the correspondence materials will be dealt with later, but it is worth noting that the telecasts

in all courses probably provide valuable motivation to independent learners who are cut off in many ways from the Open University itself.

The last learning resource in the Open University instructional system is the radio broadcasts, of which there have been one per unit this year. More will be said about these in a moment.

The development of these learning resources

These learning resources are being developed by course teams. The course teams are unusual combinations of experts. Each is headed by a 'chairman' with strong leadership powers, including that of veto! Each discipline included in the course is represented by academics, up to a total of about 15. These are the physicists, historians, psychologists, mathematicians and so on. On each course team there is also an instructional systems expert from the Institute of Educational Technology. He is a "software" development man rather than being concerned with instructional "hardware", which is the responsibility of a special advisor to the university as a whole. From the BBC, there are producers of both television and radio programmes; they have vital roles to play, as we shall see. Attached to each team is an administrator whose task it is to act as a link with service groups in the university, such as the Publishing Office, with its editors and copyright clearers, or Media Development, with its graphics-designers and so. Various other assistants completed the team.

The development of the course materials generally involves several cycles of testing and revision. The complete development schedule is too complex to describe here, but these are the main phases.

Phase one begins with detailed consideration of the available resources and constraints, before the broad areas of the course are outlined. These resources include academic manpower, published texts and funds. The constraints are many, most of them being related in some way to the short time period over which the courses are being developed. Next, the course team has to agree on the subject matter; this is no easy task. Is there anyone who can write down quickly and clearly the content of a brand new university course? Course units are then allocated to authors, and usually fall into blocks of two to six.

Once authors start work on their units, the course really begins to take shape. The BBC personnel can start on television and radio programme outlines, for example, in collaboration with the authors. Sometimes the author has the ideas, sometimes the BBC man. The authors, or the course team as a whole, will also decide what published books to use with the course.

For many units the preparation of the first outline of the correspondence material is either preceded by or accompanied by listing of objectives and key questions. The objectives and questions indicate to the learner what is expected of him in the unit.

The first outlines of the correspondence material, the television programme, and the radio programme, are discussed by working groups within each course team before being submitted to the course team as a whole. There is usually considerable debate about the integration of different disciplines within one course, and the relationship of a course with subsequent courses. There is also a need to consider at this stage the work which tutors can do and the facilities in the study centres.

The course unit author is now ready to write his first full draft of the correspondence unit. You will notice that the correspondence unit itself forms the core of the development activities as well as of the students' learning resources. At about the same time as the course unit author is writing his first draft, television and radio presenters will be chosen. The course unit author may or may not be one of them, but all the presenters chosen to date are Open University staff. The question of copyright clearance has to be attended to as well, as soon as the material to with the unit has been decided upon. The course unit author's first full draft is discussed by the working group before going to the course teams and in its amended form is often the basis for the preparation by the course unit author of assessment items, linked to the lists of objectives and key questions.

The correspondence materials plus the assessment items for each unit are then reproduced for developmental testing. They are sent to a group of applicants to the Open University who have agreed to collaborate in the trying out of the material. The data from the trial are analysed by the educational technologists, who are responsible for the developmental testing, and the results are reported to the course teams. Sometimes quite drastic changes are made on

the basis of the learners' difficulties. The revised draft of the correspondence material is then ready to go to external assessors, whose task it is to comment on the accuracy of the subject matter. The external assessors are, naturally, experts in other universities in the area covered by the course units they assess.

Meantime, the work for the television programmes has been proceeding. A detailed script has probably been prepared and the programme notes for the student considered. Searches for illustrative material will have gone on, and shooting of film will have occurred where necessary. Rehearsal and final production is scheduled to occur after the correspondence package is completed, although in some cases there has been considerable interaction between the television programme and the course unit author, leading to changes in the course unit as a result of the television programme content.

Similarly, work will have been going on towards the production of a radio programme.

The final stages of the course unit after it has been approved formally by the course team involve editing and printing, and need not concern us here.

The integration of media

This description of the production processes does not give much impression of what kinds of integration occur between the printed matter and the broadcasts, nor between these two and the tutorial system. In some subject areas, such as science, the programmes prepared for television are vital to the understanding of the course. Students outside the BBC 2 area who have not seen the telecasts may have considerable difficulty in reaching the required standard for a credit in science, if no special provision were made for them. In fact, film and audiotape replay facilities are provided through the study centres.

The integration of the science correspondence materials with the television programmes is extremely close. In a typical programme, students are being asked to turn to a particular page in the course unit, and then to enter in their course materials instrument readings and answers of various kinds. The course materials, in other words, deliberately have gaps to be filled in from the telecasts.

Criteria were established for selecting items for television in the science course. The first is that items requiring demonstrations of visual movement should go on television. The second is that the laboratory experience that conventional students have should be brought to the Open University student wherever possible on television. The third is that television should take the student into situations that he would not normally be able to go into, but which illustrate vital points in the course. An example of this last criterion in action is the filming of operations inside a nuclear accelerator. In mathematics, the telecasts include computer simulations of mathematical functions, using a technique only recently developed. In some other courses, the telecasts provide more in the way of enrichment rather than essential instruction. They are intended to deepen understanding.

The uses of the radio broadcasts vary from course to course, as with the telecasts, but a very important role played by radio is the remedial one. Television material needs extensive production facilities and is prepared far in advance of the date of broadcast. Radio is used at much shorter notice to provide remedial advice. Radio is also the natural medium for the music which will be included in the Humanities foundation course.

To put the broadcasts in perspective, however, we should note that in terms of the average student's time per week television occupies a small portion only (5%). Out of ten hours learning a week, the student watches television for only about 25 minutes. Radio occupies a similar portion of his time. Most of the remaining nine hours or more go to reading and writing, including the answering of tests. The influence of television and radio, however, should not be underestimated, in spite of this small percentage. Television probably provides the most powerful stimuli of all the learning resources.

Evaluating the effectiveness of the system

It seems clear that the Open University cannot develop a perfect model of such a complex instructional system during its first year or for its first courses. Our first courses must be thought of as first approximations. The experience gained in developing these courses is influencing the second-level courses a good deal, but slowly the Open University is setting up a comprehensive feedback network that will enable the University to use

the students' experiences to modify its system. The aim must be to establish a self-improving system. We must have at our disposal all the evaluative data necessary to judge the effectiveness of the Open University.

On the institutional research side we have a responsibility to evaluate the instruction by measuring its impact on the students. This mammoth task has only just begun, along with the University's courses, but a broad plan for evaluative research has been drawn up, and funds have been secured for portions of the plan.

The first part of the plan calls for a range of studies of the mass of data accumulating every week from the thousands of students of the University. All courses at the University include a strong continuous assessment element, and scores are derived for both tutor- and computer-marked assignments. In the first year of operations, for example, it is likely that the computer will place on file about 100,000 tutor-marked 'grades' and rather more computer-marked ones. The figures for actual question scores will be far higher, of course, and item analyses within questions will involve millions of characters. To establish a computer system capable of providing all the analyses that might be useful to the University would be very expensive. The development time would also be considerable. We have now determined which analyses will be most valuable; meantime the Data Processing Division has been using the University's ICL 1902A computer to provide basic printouts for use by the course teams.

In addition to the assignment scores being analysed, the opinions of students about the course units, including the broadcasts, are also being collected and analysed, in a pilot scheme. Another project that has been mounted is attempting to evaluate the extensive tutorial and counselling services offered by the University.

The first part of the plan also calls for a number of 'experiments'. Some of them will arise naturally, others will need to be contrived. Among those in the first category will be studies of special groups of students, such as those who do not have television, and those who enter science courses without much background in mathematics. In the second category may come studies using instructional materials that have been modified in certain ways. None of these experiments can be begun until

further funds have been secured.

The second part of the plan involves studies of the educational and occupational background of students in the Open University. A Social Science Research Council grant has been made that will allow work to begin in this area. In particular, money has been made available for the collection of data from the University's first cohort of students. An initial questionnaire has been sent to all students to cover in some detail their educational and occupational backgrounds, their work and leisure patterns, and their future plans.

Data from a representative sample drawn from the first cohort will be analysed this year to provide a basis for some of the University's major decisions about future courses. The remainder will be banked to form the basis of a longitudinal study of this group of students.

Studies of learning styles of Open University students constitute the third part of the plan. If it proved possible to identify just a few basic learning styles that were used by say 80% of the students, then the effectiveness of the instructional materials might be improved greatly. The University might also make a fundamental contribution to learning theory. But no funds are in sight for such studies as yet, in spite of the unrivalled opportunities that are offered by the large student population.

Summary

This paper has described the major learning resources available to Open University students, and has indicated how the course units in particular have been developed. The integration of these resources into an instructional system providing university education throughout the British Isles has been outlined. Some details have been provided of the steps being taken or being planned to evaluate the effectiveness of the system.

Prepared by Professor David G. Hawkridge, Director of the Institute of Educational Technology, for the Ontario Round Table Meeting on "Educational Communications and the New Technologies", convened by the Ontario Educational Communications Authority at Muskoka, Ontario, 11-15 October, 1971.

Further details about the Open University can be obtained from the following:

General information:	The Director of Information Services
Academic matters:	The Pro Vice-Chancellor (Academic Policy)
Administrative matters:	The Secretary
Instructional systems:	The Director, Institute of Educational Technology
Marketing and sales:	The Director of Marketing

All the above are at the Open University, Walton Hall, Bletchley, Bucks., England.

For inquiries about Broadcasting please contact the Chief Assistant, The Open University, British Broadcasting Corporation, Broadcasting House, London, W1A 1AA.

OPEN UNIVERSITY DATES & STATISTICS.

1963	Mr.Harold Wilson's speech in Glasgow.
February,1966.	Publication of White Paper, reporting decisions of the Parliamentary Committee under the Chairmanship of Miss Jennie Lee (now Barones Lee of Asheridge)
June, 1968	Vice - Chancellor's appointment agreed, and subsequently those of the Secretary and six Directors of Studies.
January, 1969.	Report of the Planning Committee. (reported in 18 months)
January 1st,1969.	Secretary and Vice-Chancellor's appointments took effect.
February 1st, - September 1st.	The Directors of Studies took up office.
April 23rd 1969.	Charter approved.
July 23rd 1969.	Charter formally presented by Sir Godfrey Agnew, Clerk of the Privy Council at a ceremony held in the rooms of the Royal Society; Lord Crowther of Headingley was installed as the first Chancellor. (Died Sat. 5th February, 1972)
June 1969.	1st meeting of Senate.
June 26th 1969.	1st meeting of the Council.
January 1969.	Recruiting of academic staff began on basis of 22 disciplines each with 4 members of staff, recruited over a period of two years. Each post advertised attracted an average of 40 applications (There were more than 1200 candidates for just over 30 posts)
September,1969.	40 senior (academic and administrative) staff in post. All but one of the Regional Directors appointed. Course production began in ernest.
End of 1970.	117 academic staff in post.

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Consultants involved during the planning of the University.

1. 1969 - Mr.Howard Sheath, Director of External Division of the University of New England in Armidale, New South Wales.

2. 1970 - Dr.Charles Wedemeyer of the University of Wisconsin.

3. Urwick-Diebold (data-processing systems)

4. Instructional Systems Associates.

APPLICATIONS

1970 over 42000 Weekly average: 1427

1971 35182 " " 1852

Applications for two courses

1970 45%

1971 24.98%

The Modal age.

1970 26

1971 23

Teachers

1970 35.9%

1971 30.2%

ALLOCATIONS

1970 30,000 course places were to be offered to 25,000 applicants.

1971 24,750 course places were to be offered to 21,065 applicants.

FOUNDATION COURSE ALLOCATIONS.

	1970	1971
Arts.	8000	6160
Maths.	7000	4510
Science.	7000	4400
Soc. Sciences	8000	7480
Technology.	-	2200

Part-time staff: applications received in brackets.

1971

Counsellors.	1114	(3673)
Correspondence Tutors	2119	(4471)
Class Tutors	1459	(4152)
	4692	(12296)

1972

Counsellors	1483)	(6400 + blanket mailing of forms to 1971 part-time staff)	
Course Tutors	2947)		
	4430 posts		
	(4082 individuals/	this is less duplication of part-time posts than in 1971)	

Present full-time staff.

Central academic	175)	270
Regional academic	95)	
Central FSSU Admin.	165)	237
Regional FSSU Admin.	72)	
Technicians	60	
Central Sec/Clerical	330)	488
Regional Sec/Clerical	158)	
Auxilary	68	
	1123	

B.B.C. (July 1971)

Production staff	59
Administration	16
Supporting staff	165
Sec/Clerical	70
	310

8.2.72. A.J.G.French.

THE OPEN UNIVERSITY OF THE UNITED KINGDOM

AND ITS INSTRUCTIONAL SYSTEM

1. Introduction

1.1 The Open University was established by Royal Charter on 30th May 1969, as an autonomous university. Its objects, as defined by the Charter are: "the advancement and dissemination of learning and knowledge by teaching and research by a diversity of means, such as broadcasting and technological devices appropriate to higher education, by correspondence tuition, residential courses and seminars and in other relevant ways; and to provide education of university and professional standards for its students and promote the educational well-being of the community generally".

1.2 What was finally established as "The Open University" was originally conceived as the "University of the Air". It was first spoken of by the Rt. Hon. Harold Wilson in a speech in Glasgow in 1963. Thereafter, the idea was first examined by a Parliamentary Committee convened by Miss Jennie Lee, then Minister of State for the Arts; this committee's report was published as a White Paper in 1966, recommending the establishment of a Planning Committee to examine the idea in detail. The then Secretary of State for Education and Science accordingly set up a Planning Committee: "to work out a comprehensive plan for an Open University... and to prepare a draft Charter and Statutes."

1.3 The Planning Committee which was composed almost entirely of educationists, began its work in October 1967 under the chairmanship of Sir Peter Venables, at that time Vice-Chancellor of the University of Aston in Birmingham. It presented its report, recommending the establishment of the University, in January 1969, and the government of the day accepted its recommendations.

1.4 Steps were taken early in 1969 to recruit the academic and administrative staff of the University, a site was chosen in North Buckinghamshire and the first buildings were erected in time for the incoming staff to be accommodated by September 1969. The detailed planning of the first courses began in that same month, in preparation for enrolling the first

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students in January 1971. Full details of the first courses and methods of applying are given in the University's first prospectus, copies of which have been made available. In the remainder of this paper, an attempt is made briefly to highlight the main elements of the teaching system.

2 Educational Provision

2.1 The Planning Committee had suggested that the Open University should make provision in the three main areas of undergraduate studies, post-experience training and education, and in research for higher degrees - all for adults in employment who would thus be given the opportunity of continuing education for formal qualifications at university level, studying in their own spare time. The newly-established governing bodies of the University confirmed these objectives and decided that the first priority should be in the provision of courses leading to the first degree of Bachelor of Arts. Initial recruitment of staff was in the four main academic areas of Arts, Social Sciences, Science and Mathematics, each of which would create a Foundation Course to be available in January 1971; plans were also laid to develop two additional faculties, Educational Studies and Technology. The former is intended to develop courses for the in-service training and further education of teachers and consequently has no Foundation Course. The latter will introduce a Foundation Course in 1972 and develop a full range of undergraduate, post-experience and postgraduate courses for people in industry.

2.2 The basic undergraduate provision is through a self-contained 36 week course, the successful completion of which leads to the award of a "credit". A student must earn 6 credits, i.e. complete 6 courses successfully to earn the award of the basic degree of Bachelor of Arts. Two of his courses must be at Foundation level and the remaining 4 at second or higher level. For the award of the degree of B.A. with Honours, the student must succeed in a further 2 courses, making a total of 8, and these two must be at third or fourth level (roughly equivalent to third or fourth-year courses at universities teaching full-time residential students). The system is designed to enable a student to choose widely from different faculties, with a minimum of restrictions, or to take most of his courses in one faculty. Whichever he chooses

he gains the same degree of B.A. It is expected that a "quick" student will graduate with the basic degree in three or four years, the "slow" taking five or six years. The system also allows students to have intervals of any length between their studies - women in particular are likely to find this useful on the arrival of a new baby!

2.3 Alongside the development of undergraduate courses, it is hoped to introduce from 1972/73 a programme of postgraduate studies leading to the three higher degrees of B.Phil., M.Phil., and Ph.D., and to develop a range of shorter, post-experience courses for people in industry, the public service and the professions. The postgraduate and post-experience programme will fulfil three basic needs: of those wanting to proceed directly from a first degree to a higher degree who may often in the process be re-orientated from one discipline to another; of those who having practised one profession for some years, are called upon to make a significant change in their activities, such as from the scientific into the management side of industry; and of these who need "updating" or "refresher" courses in order to keep up with recent advances in their own field of work, whether scientific, technological or managerial.

2.4 The main teaching media available to the central body of course designers were broadcasting, both radio and television, and correspondence material involving not only the printed word but also a whole range of diagrammatic and pictorial presentation techniques. However, the whole conception of teaching at a distance, at university level, through an integrated multi-media system exploiting broadcasting over public channels in support of carefully designed correspondence course material was, certainly in the United Kingdom, a novel one and presented a host of problems. Not least of these was how to harness the highly developed professional skills of the educational broadcasters in the B.B.C. to the academic skills of university teachers, almost none of whom had relevant experience since they were selected for their academic standing and reputation largely from other universities and not for their experience in broadcasting. They have, in fruitful partnership with the B.B.C., been learning "on the job" and the instructional system they are evolving is described more fully in section 3 of this paper.

2.5 The other elements of the instructional system, namely, the supporting services intended to provide the student in his own locality with study centre/viewing facilities, and a tutorial and counselling system are referred to in greater detail in section 3. They must be seen as an integral part of the total system, not as mere regional or local embellishments.

3 The Instructional System

3.1 The Open University's first intake of 25,000 students will start learning next January, through a unique instructional system. It will be unique in two ways: first, it will offer the student a unique combination of learning resources. Secondly it incorporates a comprehensive feedback network not to be found anywhere else in higher education. A computerised data bank will analyse information from students, tutors and counsellors for the benefit of course writing teams and researchers seeking to improve the system.

3.2 In considering the combination of learning resources in the system, we should state first who our students will be, since the resources have been chosen to match the learners. The Open University is enrolling people who are generally over 21 and working full-time. They do not necessarily have good secondary school qualifications. All of them wish to take a university degree because they did not have the opportunities before or could not take full advantage of them. Ideally, we should know far more about our learners, but we shall have to collect data first, as part of the feedback network.

3.3 The learning resources themselves take a number of different forms. First, and most important, the Open University student will receive regularly correspondence packages containing basic course materials. Each package will probably contain four weeks' work, separated into four units. There will be thirty-six units of study in the year for each course. A student may take one or two courses a year. A typical unit contains a considerable amount of printed exposition, illustrated by diagrams or pictures where necessary. To assist the student in assimilating the content, there are self-assessment exercises in which the student works out the answers to questions and then checks whether he is right by turning to a page on which the answers are shown. There are also unit tests or assignments, which are completed by the students and then sent to the Open University. Some of the assignments go to be machine-marked by a document reader linked to the computer. Others go to correspondence tutors to be marked and commented upon before they are returned to the students. Some units will include special materials such as glossaries. Others will direct students to special supplementary pages containing remedial or enrichment material. Also contained in the packages may be notes about the television and radio programmes.

The second learning resource available to the student is a part-time class tutor. It is planned that there will be several kinds of class tutors, not including the correspondence tutor already mentioned. The correspondence tutor will not only score the tests of assignments: he will also advise the student on further learning required. But if the student wishes to receive face-to-face assistance he will go to a study centre where he will be able to meet the class tutor. The work of the class tutors will be co-ordinated by staff tutors, who will be full-time members of the Open University staff.

The study centres represent another learning resource and will be located in about 250 communities. Besides being staffed by the class tutors they will also be places where students may meet counsellors, whose task it is to deal with any general problems students have in learning from the Open University's instructional system. For instance, if a student falls far behind, the counsellor will be there to advise him on whether to omit work in order to catch up. In the study centres there will also be television and VHF radio sets. In many study centres there will be additional facilities such as tape recorders, projectors, a library of the broadcast material in recorded form, and computer terminals for mathematics students.

The fourth learning resource available to students is the summer school. Each student will be expected to attend a summer school for one week in each foundation course. In these schools he will not only receive additional face-to-face assistance but will also engage in activities important for university level courses and impossible to arrange in the study centres. Laboratory work will feature prominently in the science summer schools for example. The summer schools are to be held in conventional universities and will fall in the middle of the Open University academic year which lasts ten months, beginning in January.

Broadcasting has an important qualitative role in the Open University instructional system. Each unit of each course next year will be accompanied by a 25 minute telecast (uninterrrupted by advertisements). The question of how the television broadcasts are integrated with the correspondence materials is dealt with under 3.5 but it is worth noting that the telecasts in all courses will probably provide valuable motivation to independent learners who are cut off in many ways from the Open University itself. Similarly, each unit will be accompanied by a 20 or 25 minute radio broadcast.

These learning resources are being developed by course teams. Four have been operating since September, 1969, and about 20 new ones began work recently or will very soon. The course teams are unusual combinations of experts. Each is headed by a "chairman" with strong leadership powers, including that of veto. Each discipline included in the course is represented by academics, up to a total of about 15. These are the physicists, historians, psychologists, mathematicians and so on. On each course team there is also an instructional systems expert from the Institute of Educational Technology. He is a "software" development man rather than being concerned with instructional "hardware", which is the responsibility of a special adviser to the university. From the B.B.C. there are producers of both television and radio programmes; they have vital roles to play, as we shall see. Attached to each team is a course co-ordinator, whose task it is to act as a link with service groups in the university such as the Publishing Office, with its editors and copyright clearers, or Media Development, with its graphics-designers and so on.

3.4 The development of the course materials involves several cycles of testing and revision. The complete development schedule is too complex to describe but these are the main phases:

First there is detailed consideration of the available resources and constraints, before the broad areas of the course are outlined. Next, the course team has to agree on the subject matter; this is no easy task. Once authors start work on their units, the course really begins to take shape. The BBC personnel start on television and radio programme outlines, for example, in collaboration with the authors. The first outlines of the correspondence material, the television programmes and the radio programmes are discussed by working groups within each course team before being submitted to the course teams as a whole. There is usually considerable debate about the integration of different disciplines within one course, and the relationship of a course with subsequent courses.

The course unit author is now ready to write his first full draft of the correspondence unit. The correspondence unit itself forms the core of the development activities as well as of the students' learning resources. The question of copyright clearance has to be attended to as well.

The correspondence materials plus the assessment items for each unit are

then reproduced for developmental testing. They are sent to a group of applicants to the Open University who have agreed to collaborate in the trying out of the material. The data from the try-out are analysed by the educational technologists, who are responsible for the developmental testing, and the results are reported to the course teams. Sometimes quite drastic changes are made on the basis of the learners' difficulties. The revised draft of the correspondence material is then ready to go to external assessors, whose task it is to comment on the accuracy of the subject matter. The external assessors are, naturally, experts in other universities in the area covered by the course units they assess.

Meanwhile, the work for the television programmes has been proceeding. A detailed script has probably been prepared and the programme notes for the student considered. Searches for illustrative material will have gone on, and shooting of film will have occurred where necessary. Rehearsal and final production is scheduled to occur after the correspondence package is completed, although in some cases there has been considerable interaction between the television programme and the course unit author, leading to changes in the course unit as a result of the television programme content. Similarly, work will have been going on towards the production of a radio programme.

The final stages of the course unit after it has been approved formally by the course team involve editing and printing.

3.5 This description of the production processes does not give much impression of what kinds of integration occur between the printed matter and the broadcasts, nor between these two and the tutorial system. In some subject areas, such as science, the programmes prepared for television will probably be vital to the understanding of the course. Students outside the BBC-2 area who have not seen the telecasts may have considerable difficulty in reaching the required standard for a credit in science, if no special provision were made for them. In fact, film and audiotape replay facilities will be provided through the study centres.

The integration of the science correspondence materials with the television programmes is quite close. In some programmes, students are being asked to turn to a particular page in the course unit, and then to enter in their course materials instrument readings and answers of various kinds. The course materials, in other words, will deliberately have gaps to be filled

in from the telecasts.

Criteria have been established for selecting items for television in the science course. The first is that items requiring demonstrations of visual movement should go on television. The second is that the laboratory experience that conventional students have should be brought to the Open University student wherever possible on television. The third is that television should take the student into situations that he would not normally be able to go into, but which illustrate vital points in the course. An example of this last criterion in action will be the filming of operations inside a nuclear accelerator. In mathematics, the telecasts will include computer simulations of mathematical functions, using a technique only recently developed. In some other courses, the telecasts may provide more in the way of enrichment rather than essential instruction. They will deepen understanding.

3.6 The uses of the radio broadcasts will vary from course to course, as with the telecasts, but a very important role to be played by radio is the remedial one. Television material will need extensive production facilities and will be prepared far in advance of the date of broadcast. Radio can be used at much shorter notice to provide remedial advice after some, at least, of the assignments have been assessed. Radio is also the natural medium for the music which will be included in the Humanities foundation course and will be used for the broadcasting of some plays and readings from literature.

3.7 To put the broadcasts in perspective, however, it should be noted that in terms of the aver ge student's time per week television occupies a small portion only (5%). Out of ten hours learning a week, the student will watch television for only about 25 minutes. Radio will occupy a similar portion of his time. Most of the remaining nine hours will go to reading and writing, including the answering of tests. The influence of television and radio, however, should not be underestimated, in spite of this small percentage. Television will probably provide the most powerful stimuli of all the learning resources.

3.8 It seems clear that the Open University cannot develop a perfect model of such a complex instructional system during its first year or for its first courses. Our first courses must be thought of as first approximations. The experience gained in developing these courses will no doubt influence

the second-level courses a good deal, but the Open University is setting up a comprehensive feedback network that will enable the University to use the students' experiences to modify its system. The aim must be to establish a self-improving system. The Open University expects to have at its disposal the evaluative data necessary to judge the effectiveness of the Open University. It is both an innovative institution and a national one. Whatever lessons can be learned from the Open University's operations can certainly be transferred to many other parts of the world where thoughts are turning towards the establishment of similar national institutions. The Open University will act as a model.

3.9 The instructional system as a whole is of key interest to the University's Institute of Educational Technology. Its main functions and its complementary interests in institutional research and the evaluation not only of the effectiveness of the learning materials but of the overall impact of the University are described in Appendix A of this paper.

4 Relevance for other countries

4.1 From the time the University was established, a steady stream of international visitors - educationists, educational administrators, politicians, broadcasters - have visited the University to learn more about the system and the nature and scope of the learning materials being produced. These have included people from highly developed countries with sophisticated educational systems as well as from rapidly developing countries with urgent needs to accelerate the pace of higher general and technological education.

4.2 All have recognised the potential benefits of a system which

(a) can bring high quality learning material to the individual in his own home or simple local study centre (whether this be the village hall, a local school or a collection of rooms in an existing technical college;)

(b) is able to avoid the very high capital costs associated with establishing a conventional, residential university; (the Open University's total capital development programme in the first five years will not exceed £6million for a very large number of students, compared with about £15 to £20 million for a modern conventional university dealing with

about 5000 students only).

(c) can deploy a relatively small body of academic staff to provide courses for very large numbers of students. (Staff in all six Open University faculties will total about 140 plus some 30 senior staff in educational technology. The central operating budget, including payments to the BBC will be less than £5 million by 1973. The costs associated with providing regional tutorial, counselling and study centre facilities for over 40,000 students in that year will be less than £3 million.)

(d) can provide an ongoing system of "continuing education" for the adult working population which at the same time will pay its rates and taxes and continue to contribute to the gross national project.

(e) will provide as an additional educational resource a whole range of carefully devised and evaluated learning materials which can be made available to other parts of the higher and further educational system at very reasonable costs.

(f) can surmount geographical and distance problems.

4.3 Broadcasting is an integral part of the Open University system, and this will provide the additional benefit of stimulating large sections of the general public. Broadcasting is not, however, a sine qua non of an operation of this kind. A number of techniques of providing visual material in recorded form are in an advanced stage of development and it is not too optimistic to expect that within the next five years, some very economic systems will be generally available.

5. Marketing of Open University Materials

5.1 With all those factors in mind, the University intends to market its educational materials to other institutions in the United Kingdom, if they wish to use them, and to lease their use by overseas governments, institutions, and broadcasting agencies. Steps are currently being taken to establish a marketing division to co-ordinate these activities.

5.2 It is envisaged that sales or leases could take the form of

(a) licencing the use of a whole course, comprising the radio programmes, television broadcast and printed correspondence material including perhaps remedial packages. The Foundation Courses in Mathematics and in Science may, for example, have key importance in any crash educational programmes in developing

countries, whose human resources for teaching these subjects may be very slender.

(b) sales of the printed materials as new kinds of text book in their own right. These may require a considerable amount of editing since the correspondence materials as presently devised contain references to the broadcast elements of the courses.

(c) the marketing of the printed units of correspondence material to people inspired by the broadcasts to ask for them.

(d) the provision not only of course materials but also of a consultancy service on the development of analogous systems utilising the teaching techniques and integrated methods of the Open University, adapted to the circumstances of the receiving country. This is a longer-term potential which will require more resources than the Open University at present commands, but the matter will be explored with a view perhaps initially to launching one or two pilot projects. In experiments of this kind, the Open University will not be able to act alone and will therefore need to examine whether other major national or international agencies are interested in being associated with and supporting the University in this.

5.3 Activities of this kind make it essential for the Open University to have a high degree of freedom in the exploitation of its system and materials. To this end, the whole question of Rights and Copyright, both in the broadcast elements and in the printed materials has been carefully examined, and the contracts being made will in most cases give the University the right to lease the external use of the material subject to the payment of additional fees.

6. The Admissions System and Enrolments for 1971

6.1 One firm principle of the Open University's system is that no formal educational requirements are required for admission. The University therefore devised a selection procedure operated by a computer whereby selection was made primarily on the basis of those applying first having the greatest chance of earning a place as a student. Three constraints were, however, introduced to ensure that

6.5 Obvious points of interest are:

(a) the very high number of teachers who applied. They knew most about the Open University, which had been a matter of educational and political debate for some time; had much to gain by acquiring a degree qualification since their salary prospects under present arrangements in the U.K. would be immediately enhanced;

(b) Only 4.5 of the applicants already have a degree qualification;

(c) A fairly high proportion (14.7%) are from the ranks of partially qualified scientists, engineers, laboratory assistants and technicians who wish to get a degree qualification.

(d) The Proportion of "working class" candidates is low. This is no doubt partly due to the fact that information about the University and the new opportunities it presents will take some time to reach these occupational groups; and they also will need a certain amount of persuading to take the new opportunity. The University's information services are aware of this problem and steps are being taken to disseminate information through industrial and commercial firms.

One interesting point not shown in the tables is the distribution between sexes: 70% males, 30% females.

6.6 One year's statistics is no basis for a rational judgment about the nature of the impact on society of the Open University. It will be interesting to see to what extent the broadcasting of the University's courses in 1971 will affect the nature of the applications.

October 1970

A CHRISTODOULOU
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APPENDIX A

EDUCATIONAL TECHNOLOGY AT THE OPEN UNIVERSITY

Introduction

Technology, to most people, involves machines. But more correctly technology involves men, machines and materials. In educational technology, machines have received undue attention in some countries, and too little effort has been expended on examining the men and materials in the instructional systems incorporating those machines. Machines, whether they are television networks, computers or tape-recorders, must fit into the system as a whole.

Educational Technology at the Open University has adopted the 'systems approach'. That is to say the educational technologists are attempting to develop an instructional system in which all three, men, machines and materials, have their proper places. In this system there must be careful analysis of each of these three components as they are synthesized into an integrated whole.

The Institute of Educational Technology

Within the Open University, an Institute of Educational Technology has been established, occupying a central position between the six Faculties (Arts, Educational Studies, Mathematics, Science, Social Science and Technology) and the service units of the University (the Secretariat, the Media Division, the Library, and the Regional Academic Services). Outside the University, the BBC occupies an important position, of course, providing production and broadcast facilities for television and radio.

Course Development Functions of the Institute

Within the Faculties, teams are developing the correspondence core and other elements of each course. Educational technologists from the Institute are active members of each of these teams. They are undertaking three critical course development functions: first, they are advising on the design and structure of courses; second, they are writing tests for use with the courses; third, they are arranging and conducting trials of course components.

The writing of appropriate test questions for the courses is important because the students' answers to the questions will provide much information on how well the course has taught. At this early stage of course development, however, the questions are also important because the process of writing them demands careful analysis of course material. This analysis is being undertaken, in most cases, through a dialogue between the educational technologists and the writers of the course material. The dialogue results in improved questions and improved course material. Objectives and exposition are clarified.

Trials of course components are invaluable in the context of the Open University's first years. Little is known about the learners entering the system. Initial drafts of correspondence material, and tapes of television and radio broadcasts need to be tried out on a variety of adults, preferably ones likely to become Open University students. The items prepared by the University's staff on the basis of experience and intuition are put to the test. The empirical data gathered from the trials are powerful persuaders, and in some cases extensive revisions are made.

Besides performing these two critical course development functions - preparing test questions and conducting trials - the Insitute staff are also engaged in putting together a guide for Open University students. The Open University is so different from anything the students will have been in before that special instructions will be provided about how to study in the University's multi-media system. General advice will also be offered on study habits, reading

skills, and so on. The first edition will have to be tentative, however, as the exact problems the students will meet and the solutions some of them will discover are not yet known.

Course Research Functions of the Institute

If future course development is to be satisfactory, there must be far more data available than the trials provide. Each trial involves only a few learners (up to 50, but usually only about 25) working under different conditions from the 'real' students who will take the courses in 1971 and later. Plans are being laid to conduct a major and comprehensive evaluative research programme at the Open University, but in the meantime data are being collated from a small research project involving adults taking courses similar to those of the Open University but at a lower level. The National Extension College at Cambridge is offering courses by correspondence that are supplemented by BBC TV programmes. The students taking these courses are being assessed by the Open University in various ways. In particular, their reactions to the different components of the courses are being measured through questionnaires. Their problems in studying and their general background is being examined too. Information from this project should be available soon to the Open University course writers, who should find the data helpful. The NEC/BBC courses are intended to help adults to get back into the world of learning, possibly at the Open University.

Future Course Research

The major evaluative research programme that should be undertaken if the Open University is to have a self-correcting and self-improving instructional system is not yet in operation.

As a basis for the extensive course research proposed, a computerized data bank will be set up. Several major studies will be based upon the data bank. One main study will be mainly a series of diagnostic analyses. Another will include longitudinal surveys of students before and after graduation. A third will be an evaluation of the tuition and counselling components of the system.

Computerized Data Bank

Data will be collected for the data bank chiefly from the students themselves. Other data sources will be University staff including tutors, counsellors, and others, and employers. Collecting the data has already begun at the Open University; for each student a file is being established on computer tape. Later, students will be asked to complete mailed questionnaires. The data from these questionnaires will be stored on a direct access computerized system which will permit retrieval of information in many forms. Computer programmes are being developed to conduct analyses to suit the needs of the University.

Diagnostic Analysis

The modification of course material must be done with the characteristics of men (the learners) and machines (the media) more accurately borne in mind than can be done at present. There must be less dependence upon intuition, although leaps of intuition will still be required. The diagnostic analyses should give evidence of the effectiveness of different course segments, and, possibly, of the effectiveness of different media. Similarly, it should be possible to compare the success of differing groups of students, and the effectiveness of tutors. The chief aim of all these analyses is to assist in further course development.

The University is particularly concerned about the drop-out problem. The experience of many other institutions that have used one or more of the components that are in the Open University instructional system shows that a high

drop-out rate must be expected among students studying at a distance. Yet the cost effectiveness of the system is improved greatly if the drop-out rate can be reduced. As in most preventive systems, the earlier the potential drop-out can be identified, the better. Diagnostic analyses should assist in this identification.

Longitudinal Surveys

In the second major study, the men involved in the system at the learning end, are to be the subject of detailed study over several years. The impact of the Open University upon its students, before and after graduation, is to be assessed. The career patterns of the students will be of particular interest. The students' employers will be questioned too.

In the same study there will be an examination of changes in the use of leisure, and in particular of the use of mass media. It seems likely that the demand made by the Open University upon students' free time will have some remarkable effects. The large numbers of students involved will provide an unparalleled opportunity for study of these effects.

Tuition and Counselling

The Open University will be providing university education for a very wide range of students, some of whom will need greatly the support of face-to-face tuition and counselling. Very little is known, however, about the kinds of support that will be required. The exact roles of the tutors and counsellors must be defined, and their effectiveness evaluated, particularly as they comprise a relatively costly part of the system.

The Open University as an Instructional System

There are two premises upon which the Open University is being developed as an instructional system. The first is that there should be cycles of development and testing through which are put as many components as possible. Thus the develop-test-develop cycle is found in many areas of the Open University's functioning. Although it is to be found too in conventional universities, in the Open University there is a much more conscious attempt to put the cycle into action. The second premise is that the Open University will operate as a 'closed loop' total instructional system (see diagram). The controllers of the university are the academic staff. This is true of all British universities. They have between them a subject matter store from which they select displays. The selected displays comprise a chosen scope and sequence of subject matter to be presented through selected media. The student receives the selected displays and is subsequently questioned on his acquisition of knowledge from the subject matter store through the displays. His responses are fed into an evaluator which determines whether they are correct or incorrect. The evaluator may consist of a computer scoring mark-sense cards, or a correspondence tutor assessing assignments. The performance of the student is placed in some form of performance memory, probably the computerized data bank, and is notified to the academic staff. The academic staff may then choose to make a new selected display from the subject matter store in order to correct the students' incorrect acquisitions from the first selected displays. Naturally the tutors have a major role to play in this latter process.

The Open University will operate on the basis of information retrieved from the students, and will endeavour to modify its courses on the basis of this feedback.

The analysis and synthesis of the sub-systems necessary to produce this instructional system for the Open University are among the functions of the Institute of Educational Technology.

OPEN UNIVERSITY ADMISSIONS: 1971

TABLE I

REGIONAL ANALYSIS

Region	APPLICANTS				ALLOCATION OF PLACES (PROVISIONALLY) AND SUBJECT TO FURTHER MODIFICATIONS	
	Number	Percentage of total	Estimate of Percentage of Population in Region	Quota set after scrutiny of applications	Percentage allocated places	Absolute number allocated places
London	7571	18.5	17.9%	18.2	18.0	4503
South	4621	11.3	8.0%	10.1	11.3	2813
South West	2332	5.7	6.1%	5.9	5.6	1411
West Midlands	3452	8.5	9.2%	8.9	9.0	2238
East Midlands	2699	6.6	7.0%	6.8	7.1	1765
East Anglia	3497	8.6	7.8%	8.4	9.1	2282
Yorkshire	3112	7.6	8.5%	8.0	7.8	1957
North West	4337	10.6	12.1%	11.3	11.5	2873
Northern	2080	5.1	5.5%	5.3	5.4	1356
Wales	1801	4.4	4.9%	4.6	3.6	892
Scotland	3787	9.3	9.4%	9.3	9.0	2262
Northern Ireland	1528	3.7	2.7%	3.2	2.6	648
	40817	99.9	100.0%	100.0	100.0	25000

OPEN UNIVERSITY ADMISSIONS: 1971

TABLE II

OCCUPATIONAL ANALYSIS

(Numbers given refer to non-graduates, those in brackets refer to graduates)

APPLICANTS

Occupational Group	Number	Percentage of total	Quota set after scrutiny of applicants	Percentage allocated places	Quota percentages as absolute numbers	
1. Housewives	3,758	8.9 (0.3)	10.0% (0.1%)	9.6 (0.2)	2,500	(25)
2. Armed Forces	699	1.7	2.0% (0.1%)	2.0	500	(26)
3. Administrators and Managers	2,830	6.6 (0.3)	4.5% (0.1%)	5.4 (0.2)	1,125	(25)
4. Teachers	14,642	33.6 (2.3)	30.0% (1.0%)	33.0 (1.3)	7,500	(250)
5. Professions and the Arts	4,869	11.3 (0.6)	8.5% (0.1%)	9.7 (0.3)	2,125	(25)
6. Qualified Scientists and Engineers	3,275	7.3 (0.7)	8.0% (0.1%)	9.0 (0.3)	2,000	(25)
7. Draughtsmen, Laboratory Assistants and Technicians	3,037	7.4 (0.1)	9.0% (0.1%)	9.1 (0.1)	2,250	(25)
8. Electrical, electronic, metal and machines and allied trades	730	1.8	3.0% (0.0%)	2.3	750	(0)
9. Other manufacturing, farming, mining, construction, transport and communications	1,171	2.8	5.0% (0.1%)	3.1	1,250	(25)
10. Clerical and office staff	3,324	8.1 (0.1)	10.0% (0.1%)	8.0 (0.1)	2,500	(25)
11. Shopkeepers, sales, services and sport, recreation workers, Fire Brigade and Police	1,409	3.4	4.5% (0.1%)	3.7	1,125	(25)
12. Not working (other than housewives) retired, independent means	1,040	2.4 (0.1)	3.0% (0.1%)	2.4 (0.1)	750	(25)
13. In institutions	33	0.1	0.5% (0.0%)	0.1	125	(0)
	40,817	95.4 (4.5)	98.0% (2.0%)	97.4 (2.6)	24,500	(500)

OPEN UNIVERSITY ADMISSIONS: 1971 TABLE III

COURSE ANALYSIS

20,000 Students will take one Foundation Course each and 5,000 will take two, giving a total of 30,000 courses studied during the first year.

The analysis of applications for courses received and the recommended quotas are:

Course	Number	% of Total	Target Quotas
Mathematics	12,039	19.4	7,000
Science	11,605	18.7	7,000
Arts	16,939	27.3	8,000
Social Sciences	21,564	34.7	8,000
	62,147		30,000

The Open University as an Instructional System